DMT
DANISH MYO TECHNOLOGY

PRESSURE INTERFACE

FOR PRESSURE MYOGRAPH SYSTEMS

User Manual

Version 1.1

PRESSURE INTERFACE

FOR PRESSURE MYOGRAPH SYSTEMS

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Changes may have been made to the software and hardware it describes since then.
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Pressure Interface

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SAFETY

The Pressure Interface has been designed for use only in teaching and research applications. It is not intended for clinical or critical life-care use and should never be used for these purposes. Nor for the prevention, diagnosis, curing, treatment, or alleviation of disease, injury, or handicap.

- Do not open the unit: the internal electronics pose a risk of electric shock.
- Do not use this apparatus near water.
- To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Objects filled with liquids should not be placed on the apparatus.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Only use secure industry standard connectors and tubing for pressure connections. Faults, defects and mistakes due to wrong connections void warranty. We are not accountable for results and mistakes due to inappropriate pressure hookup.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
- Only use attachments and accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.

The Pressure Interface is delivered with an external 100-240VAC to 24VDC ADAPTER.

Protect the power ADAPTER and cord from being walked on or pinched. Particularly at power plugs and the point where they connect to the apparatus.

Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way; such as, the power-supply cord or plug is damaged, liquid has spilled onto or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

UNPACKING THE PRESSURE INTERFACE AND MYOGRAPH SYSTEM

Please take a few minutes to carefully inspect your new Pressure Myograph System for damage, which may have occurred during handling and shipping. If you suspect any kind of damage, please contact us immediately and the matter will be pursued as soon as possible. If the packing material appears damaged, please retain it until a possible claim has been settled.

We recommend that you store the packing material for any possible future transport of the Pressure Myograph System. In case of transport, and the original packing material is unavailable, please contact the DMT Sales Department for advice and packing instructions. After unpacking your new Pressure Myograph System, please use the following list to check that the system is complete:

Pressure Myograph Unit:
- Force calibration kit (including “bridge”, “balance” and 2 gram weight)
- Resistance tube shunt (calibration tube)
- Two glass cannulas
- Chamber cover

Pressure Interface:
- Pressure Interface-to-chamber cable with a temperature probe
- Power adapter (the shape of the AC plug varies by country; be sure that the plug has the right shape for your location)
- USB cables for PC connection.
- Atlas Copco Cablair hose for main pressure supply
- Two 500ml Schott Duran Bottles with specially designed screw caps

Riester “Big Ben” Pressure Manometer

Accessories:
- Allen key
- Spare screws
- Small screwdriver
- Suture wire
- Tube of high-vacuum grease
- Tube of grease for linear slides
- Silicone tubing: internal diameter 1mm

Computer, hardware, software & manuals:
- USB digital camera (optional)
- CD with DMT Pressure Myograph Systems user manuals
- CD with MyoVIEW II software program (optional)
- Computer (optional)

FlowMeter – Model 161FM (optional):
- User manual “FlowMeter – Model DMT 161FM”
- MyoFlow™ FlowMeter software including drivers (CD-ROM)

Peristaltic pump for superfusion flow (optional):
- Watson Marlow peristaltic pump

CHAPTER 1 - SYSTEM OVERVIEW

1.1 Pressure Interface

Figure 1.1 *The Pressure Interface - front panel*

Figure 1.2 *The Pressure Interface - rear panel*

1.2 Pressure Myograph Unit

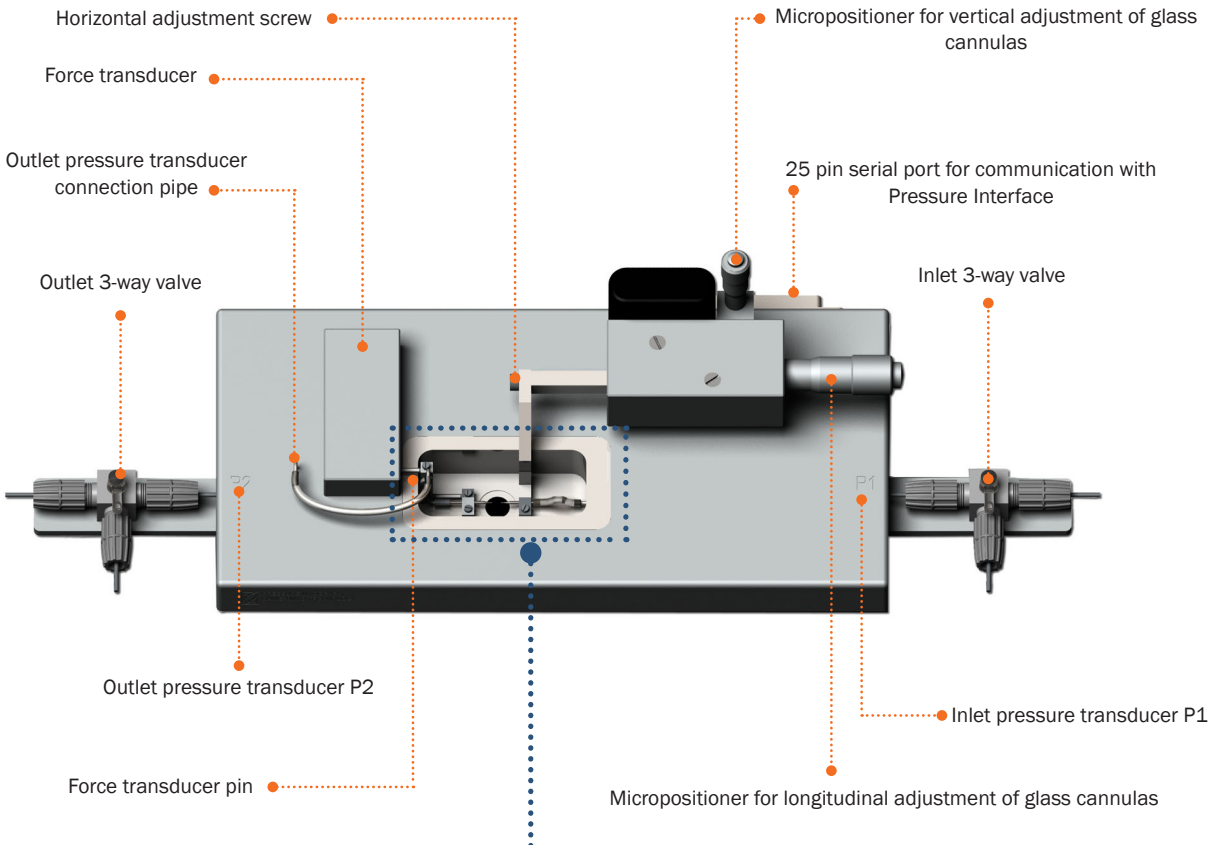

Horizontal adjustment screw
Micropositioner for vertical adjustment of glass cannulas
Force transducer
Outlet pressure transducer connection pipe
25 pin serial port for communication with Pressure Interface
Outlet 3-way valve
Inlet 3-way valve
Outlet pressure transducer P2
Inlet pressure transducer P1
Force transducer pin
Micropositioner for longitudinal adjustment of glass cannulas

Figure 1.3 *The Pressure Myograph Unit*

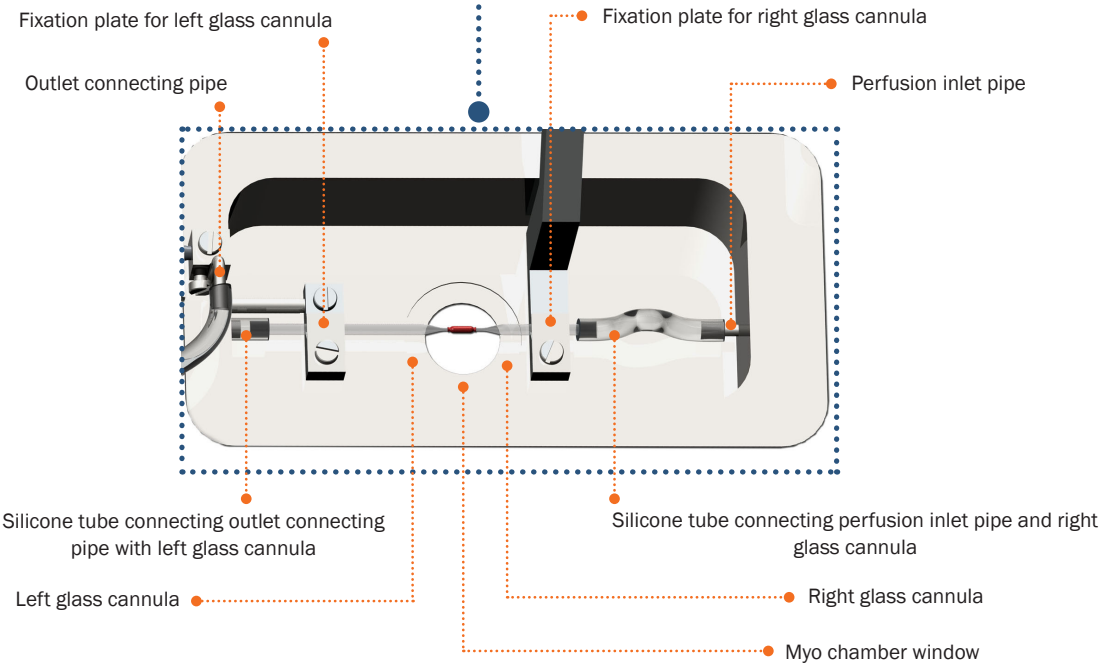

Fixation plate for left glass cannula
Fixation plate for right glass cannula
Outlet connecting pipe
Perfusion inlet pipe
Silicone tube connecting outlet connecting pipe with left glass cannula
Silicone tube connecting perfusion inlet pipe and right glass cannula
Left glass cannula
Right glass cannula
Myo chamber window

Figure 1.4 *The Pressure Myograph chamber - magnified*

CHAPTER 2 - SETTING UP THE PRESSURE MYOGRAPH SYSTEM

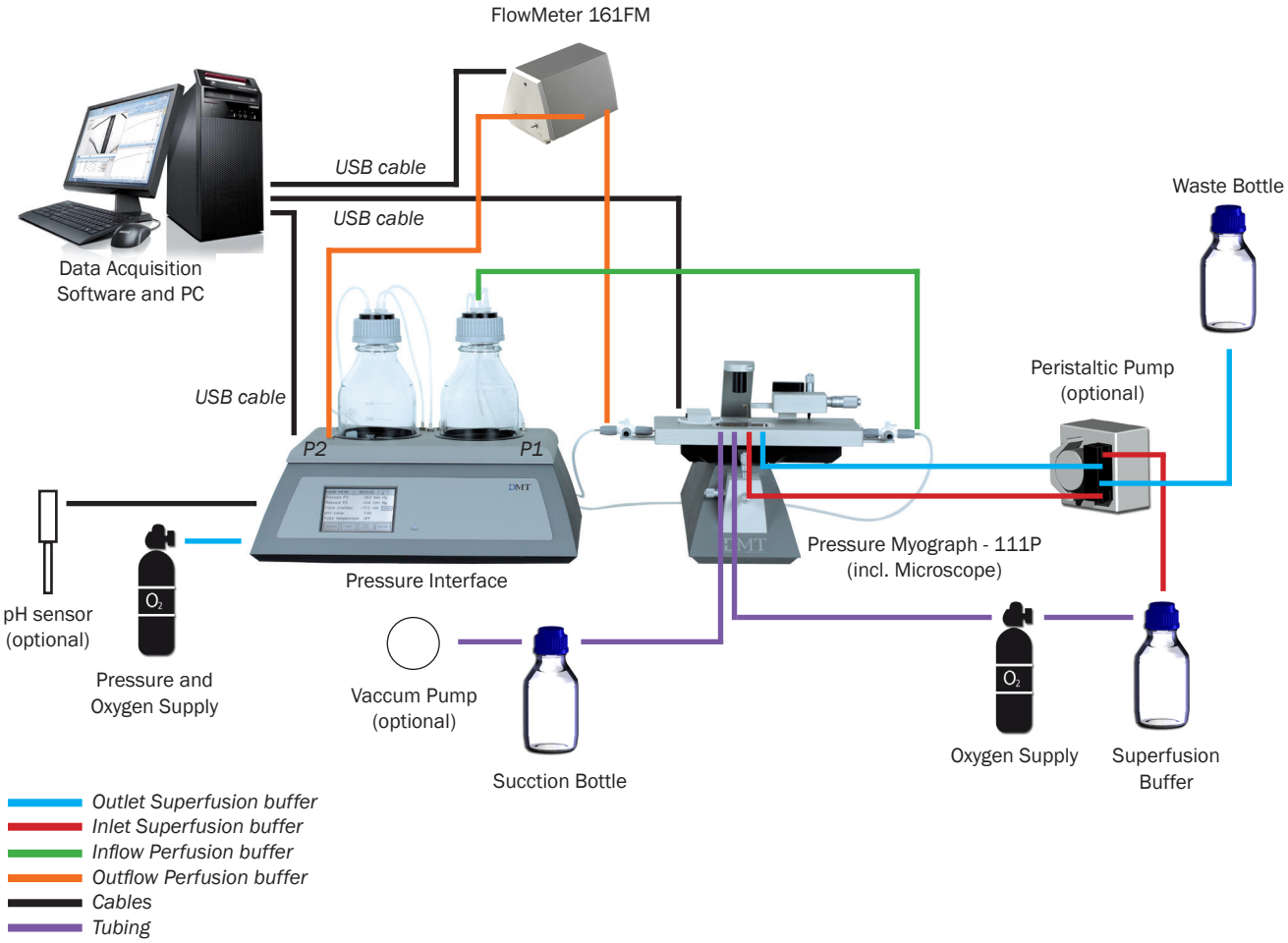


Figure 2.1 *Example of the Complete Pressure Myograph System - Model 111P*

Fig. 2.1 is a diagram of a complete setup for the Pressure Myograph System - 111P. The diagrams include optional equipment such as a peristaltic pump to enable superfusion flow and pH probes for measuring pH in the superfusion buffer. Also the diagram includes the DMT Flowmeter DMT 161FM. The Flowmeter enables flow measurements in the range of 15-4000µl/min.

Fig. 2.1 is intended as an overview of the setup of the Pressure Myograph Systems. A detailed step-by-step description is provided in the remaining sections of Chapter 2.

The Pressure Myograph System will work with a range of different microscopes; the DMT Microscope, Zeiss Axio Vert A1, Nikon TS-100F, Motic AE2000 or your own inverted microscope of choice.

NOTE: THE MICROSCOPE IS ESSENTIAL FOR THE DIMENSIONAL ANALYSIS OF THE MOUNTED VESSELS.

The DMT Microscope is a standard inverted microscope with a built-in digital CCD USB camera. The DMT Microscope is very effective and recommended in setups requiring standard image analysis.

The Zeiss Axio vert A1 is an inverted microscope that provides the highest degree of flexibility in image analysis. The Zeiss Axio vert A1, a Nikon TS-100F and Motic AE 2000 enable the use of a wide range of objectives and facilitate sophisticated fluorescence techniques.

Contact the DMT Sales Department for further product information and prices on any optional equipment, including microscopes.

2.1 Setting up step-by-step

NOTE: IF YOU HAVE PURCHASED A COMPUTER FROM DMT IN CONJUNCTION WITH YOUR PRESSURE MYOGRAPH SYSTEM THEN THE MYOVIEW II DATA ACQUISITION SOFTWARE HAS ALREADY BEEN INSTALLED WITH DRIVERS FOR THE DIGITAL CCD USB CAMERA. FOLLOW THE PROCEDURES IN SECTION 2.2 TO SETUP THE PRESSURE MYOGRAPH SYSTEM.

If you have not purchased a computer from DMT follow the MyoVIEW II Quick Installation Guide to install MyoVIEW II on your own computer.

2.2 Setting up the complete Pressure Myograph System

This section describes how to connect the cables in the Pressure Myograph System as illustrated in figure 2.1. Before connecting any of the myograph equipment ensure that for the 110P Pressure Myograph system that the USB camera is connected to your PC. For the 111P Pressure Myograph system please connect both USB cable of the DMT microscope to the computer. Install the MyoVIEW II Data Acquisition Software on your PC as described in the MyoVIEW II Quick Installation Guide.

NOTE: BEFORE PROCEEDING WITH THE CONNECTION PROCEDURE, MAKE SURE THAT THE PRESSURE INTERFACE, THE MICROSCOPE AND THE PC ARE SWITCHED OFF.

1. **Pressure Myograph Unit to Pressure Interface connection:**
   Connect the Pressure Myograph Unit to the Pressure Interface by using the grey 25/44-pin connection cable. The end of the cable with the temperature probe is connected to the Pressure Myograph Unit.

2. **Pressure Interface to PC connection:**
   Connect the Pressure Interface to the computer with the USB cable, from the back panel of the Pressure Interface to the USB port on the computer.

3. **Pressure Interface and oxygen supply connection:**
   Connect the “Oxygen” inlet on the back panel of the Pressure Interface to an adjustable oxygen supply using the “Atlas Copco Cablair hose” delivered with the Pressure Myograph System.

IMPORTANT MAKE SURE THAT THE HOSE IS SECURELY FASTENED TO THE “OXYGEN” INLET USING THE HOSE CLIP. THE PRESSURE FROM THE OXYGEN SUPPLY MUST NOT EXCEED 1.0 BAR!

4. **Microscope/camera to PC connection:**
   Inside the DMT Microscope there is a USB camera wired to a USB cable and one USB cable to power the microscope light. Connect the two USB cable from the DMT microscope to the computer USB ports. For the 110P system with the external USB-camera connect the USB cable from the USB Camera to your PC for the 110P system.

5. **Pressure Interface to external data acquisition system connection (optional):**
   If you have not obtained the MyoVIEW II software the four BNC ports on the rear of the Pressure Interface enable connection of an external data acquisition system for recording inlet pressure P1, outlet pressure P2, longitudinal force, probe temperature, chamber temperature, flow ON/OFF, pressure ON/OFF, pH1 value and (Optional Dig out1, Dig out2, Dig in1 dig in2).

6. **Turn on the power:**
   Turn the main power to the Pressure Interface ON at the power switch. Turn ON the computer. The Pressure Myograph System is now ready to be used with MyoVIEW II Data Acquisition Software.

NOTE:
A DETAILED GUIDE TO CONNECTING THE PRESSURE MYOGRAPH SYSTEM FOR AN EXPERIMENT IS DESCRIBED IN DETAIL IN CHAPTER 5.

For installation of MyoVIEW II refer to the MyoVIEW II Quick Installation Guide.

2.3 The first weight and pressure calibrations

Prior to shipment the Pressure Myograph System has gone through two days of continuous testing, including final weight and pressure calibrations. However in order to ensure that the Myograph is working at highest performance, DMT recommends that new weight and pressure calibrations are performed before the first use.

The weight and pressure calibration procedures are described in detail in chapter 3.6.1 and 3.6.2.

2.4 External Pressure Myograph Unit connections

This section illustrate how to connect the perfusion circuit, the superfusion circuit, oxygen supply, pressure supply and suction device on to the Pressure Myograph unit.

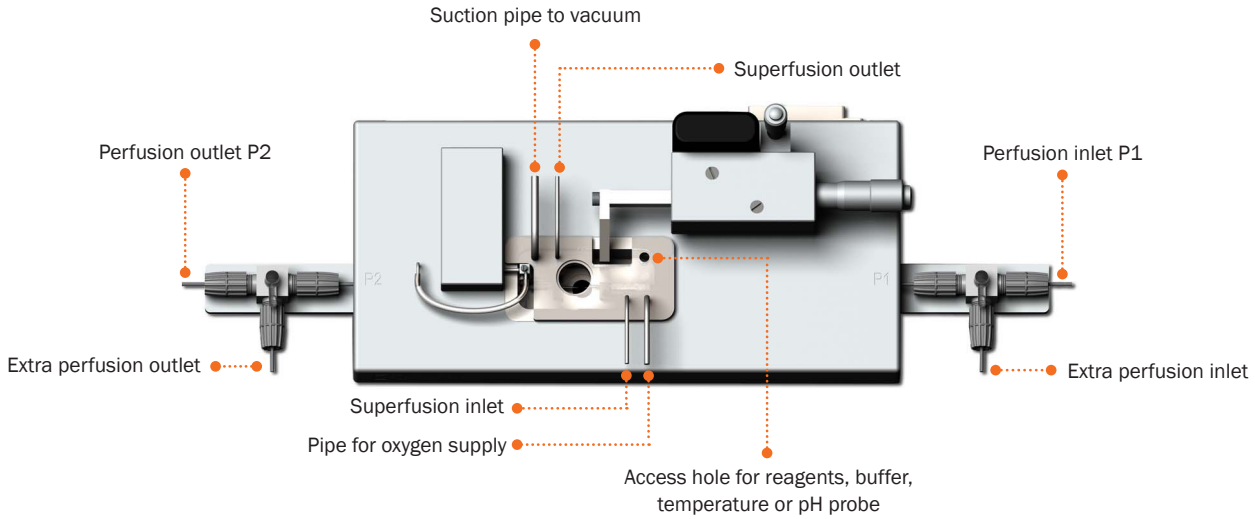


Figure 2.2 *External Pressure Myograph connection*

2.5 Connecting perfusion flow

The perfusion flow is controlled by the Pressure Interface. Instructions on how to control the perfusion flow are provided in chapter 3.

To connect the Pressure Interface to the Pressure Myograph unit, use the silicone tube (internal diameter 1mm) delivered with the Pressure Myograph System.

- Connect the “perfusion inlet” at P1 on the Pressure Myograph (see figure 2.3) to the P1 outlet on the cap of the buffer bottle (see fig. 2.3).
- Connect the “perfusion outlet” at P2 on the Pressure Myograph Unit (see figure 2.3) to the P2 inlet on the Pressure Interface (see fig. 2.3).

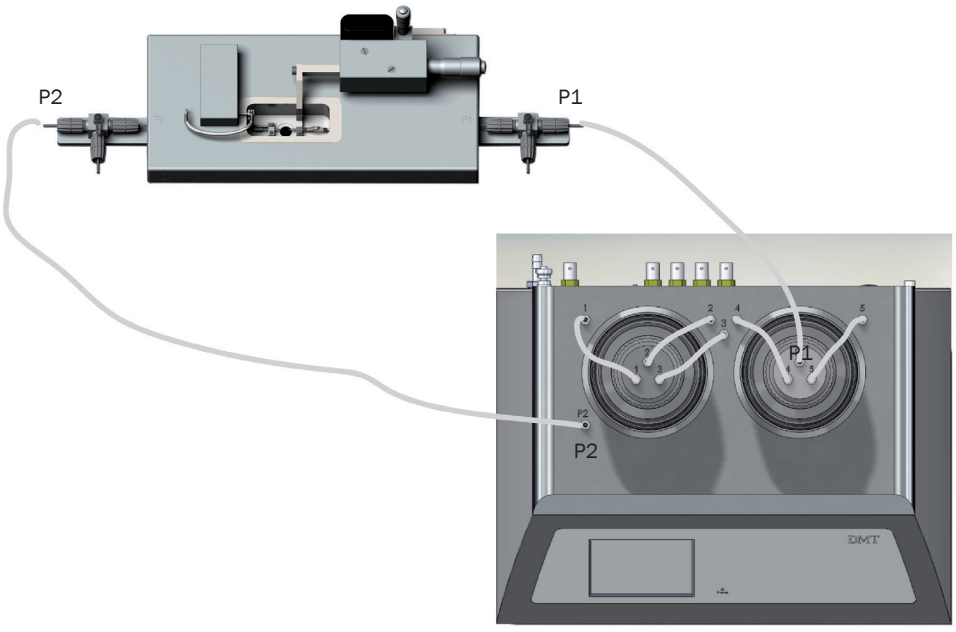


Figure 2.3 *Pressure Interface tube connection*

NOTE I
TO FILL THE TUBING AND AVOID AIR BUBBLES, MOUNT THE "CALIBRATION SHUNT TUBE" AS DESCRIBED IN CHAPTER 5. FILL THE P1 SCHOTT BOTTLE WITH A MAXIMUM OF 400 ML OF BUFFER. IN THE "PRESSURE" MENU SET THE PRESSURE P1 AND P2 AS FOLLOW:

P1 = 150mm Hg
P2 = 70mm Hg
Set the Pressure ON
Set Flow ON

Let the pressure regulator run until no air bubbles are visible in the perfusion circuit.

IMPORTANT
NEVER RUN AIR BUBBLES THROUGH A VESSEL AS THIS MAY DAMAGE IT.

NOTE II
NEVER FILL THE BUFFER BOTTLE WITH MORE THAN 400 ML OF BUFFER AS HIGHER VOLUMES MAKES PRECISE CONTROL OF THE PRESSURE MORE DIFFICULT.

2.6 Extra perfusion inlet/outlet

The extra perfusion inlet/outlet 3-way valves on the Pressure Myograph allow the introduction of special agents or reagents to the perfusion circuit during an experiment. They are situated at P1 and P2 on the Myograph Chamber and the small handle on top of the valves controls the flow direction.

2.7 Connecting superfusion flow (optional)

Creating a superfusion flow in the Pressure Myograph Chamber requires an external peristaltic pump, which is not part of the basic Pressure Myograph System. Contact DMT for further information about recommended perfusion pump models, specifications and prices.

The superfusion circuit is connected to the Pressure Myograph Unit as illustrated in fig. 2.1.

2.8 Connecting the Flowmeter – DMT 161FM (optional)

The DMT Flowmeter – Model 161FM is optional for flow measurements in the range of 15 – 4000µl/min. The Flowmeter is easily combined with any DMT Pressure Myograph System as illustrated in fig. 2.1.

Use of the Flowmeter permits control of intravascular pressure, pressure gradient and flow conditions with high accuracy. This enables in vitro studies on vessel segments under conditions very close to those found in vivo. Adding the DMT FlowMeter DMT 161FM to the Pressure System also enables measurement of flow rate as a parameter. The Flowmeter data will make it possible to record live traces of the flow dependent parameters as shear stress, Reynolds number and vascular resistance due to changes in vessel structure and function in various physiological and pharmacological studies.

To add the FlowMeter DMT161FM to the Pressure System the cable from the flow is attached to the "Flowmeter" port marked on the backside of the Pressure Interface. The Software MyoVIEW II will recognize the Flowmeter DMT161 as soon as it is connected to the Pressure Interface and will be ready for use immediately. Please consult the MyoVIEW II video manuals linked in the help menu of MyoVIEW II.

2.9 Connecting the oxygen supply

Connect the oxygen supply pipe on the Pressure Myograph Chamber cover to an adjustable oxygen supply. See figure 2.2 "Pipe for oxygen supply".

2.10 Connecting a suction device

Connect the “large” pipe on the Pressure Myograph Chamber cover to a vacuum pump via a suction bottle and a vacuum valve as illustrated in fig. 2.1. The internal diameter of the silicone tube used for this connection must be 2 mm. (A 2 mm tube is not included with the Myograph System).

2.11 3-Way valve adjustments

The 3-way valves on each side of the Pressure Myograph Unit (at P1 & P2) have three different settings to control the inlet / outlet flow to the Pressure Myograph Chamber. The flow settings are illustrated in fig. 2.4 and fig. 2.5.

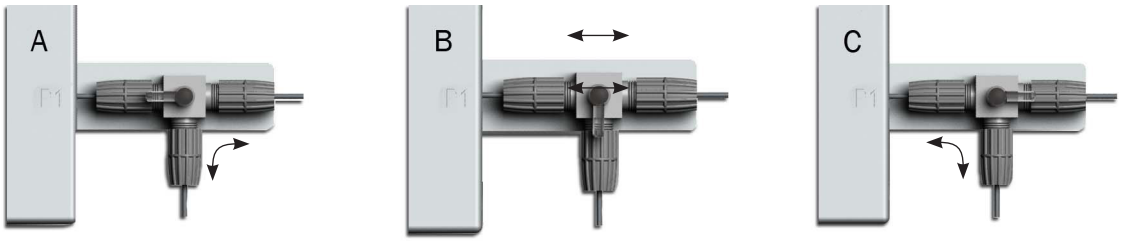


Figure 2.4 *Three-way valve flow settings at P1*

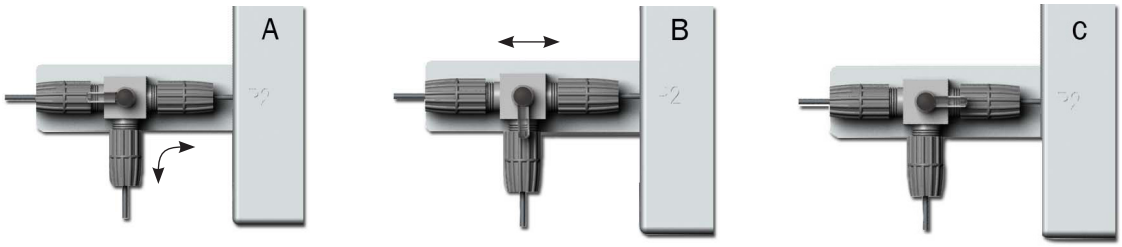


Figure 2.5 *Three-way valve flow settings at P2*

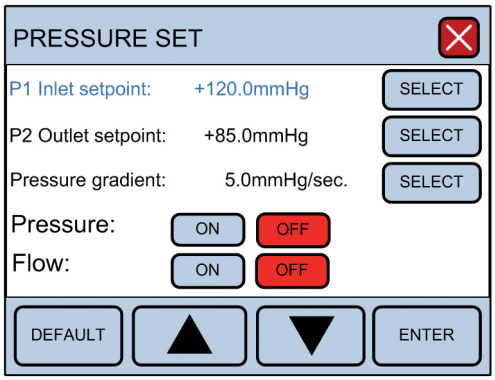
CHAPTER 3 - THE PRESSURE INTERFACE MENUS

This chapter contains a detailed description of how to navigate the touch-screen menus and how to use the special features of the Pressure Interface.

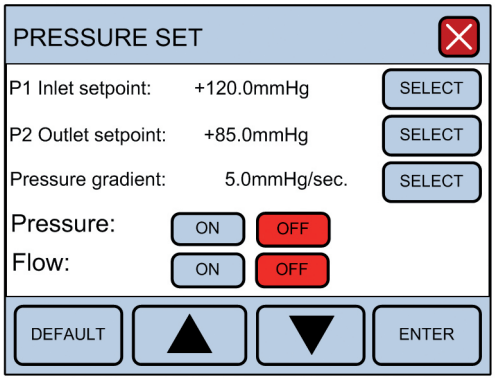
3.1 General description of how to navigate the touch-screen

Menus on the Pressure Interface are all accessible by a touch-screen. To access a menu, simply touch the corresponding button on the screen. When a setting needs to be changed, press the relevant “SELECT” button or in the display below, touching the “ON” or “OFF” buttons.

The line selected will turn blue, indicating that the interface is in edit mode and waiting for input. When “DEFAULT” is chosen, a default value will be displayed. To change the numeric value for the selected parameter touch the up or down arrow keys.



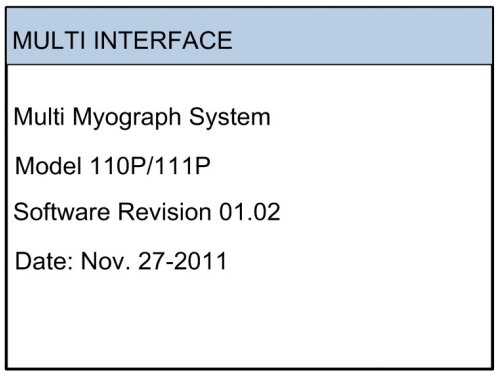
Once the desired setting has been chosen, pressing “ENTER” will save the selection, and the new value will be stored in memory. The selected line will revert to black. Pressing the white “X” in the red box will exit the menu and return you to the Main Menu.



3.1 Power-up screen

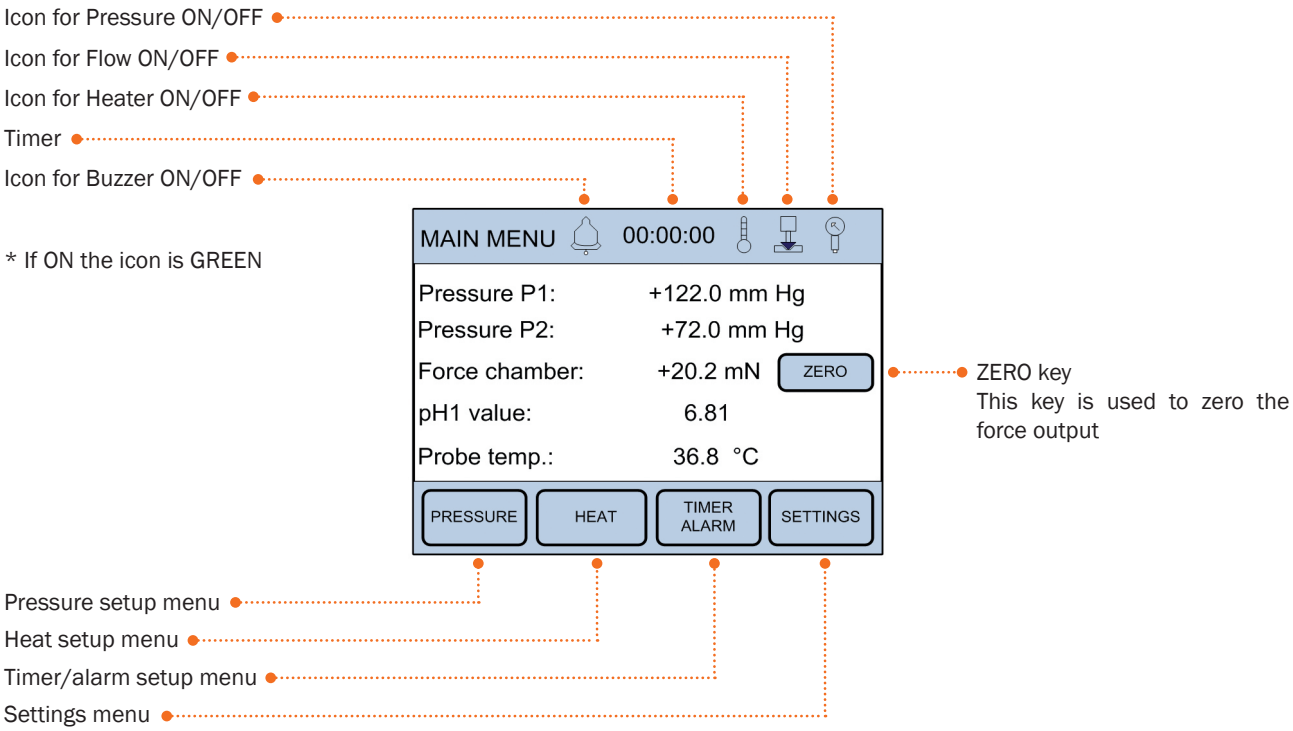
After turning on the Pressure Interface, an “Introduction” screen appears. It displays the software versions number. While this screen is displayed the system is auto-initialising.

After a few seconds, the “MAIN MENU” display will appear.



3.2 Main Menu

The Main Menu gives a good overall picture of how the Pressure Interface is working. It displays values for the input pressure, output pressure, force, pH, probe temperature and time, and the status of systems including the time, heat, flow and pressure.



Buzzer icon:
This icon indicates the status on the Buzzer.
If the icon is grey the Buzzer is OFF.
If the icon is green the Buzzer is ON (active).
The Buzzer will make a sound when the Timer reaches zero.

Timer:
The Timer is a countdown watch that can be set to a maximum of 24 hours.
If the buzzer is activated it will sounds when the timer reached zero.

00:00:00

Heat icon:
This icon indicates the status of the chamber heat.
If the icon is grey Heat is OFF.
If the icon is green the Heat is ON (active).

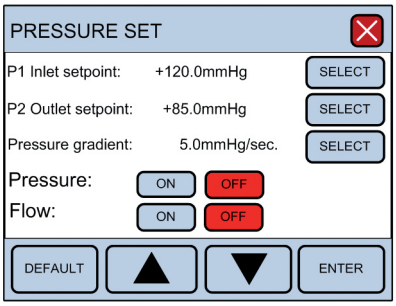
Flow valve icon:
This icon indicate the status on the Flow valve.
If the icon is grey the Flow valve is OFF (NO Flow).
If the icon is green the Flow valve is ON (active).

Pressure icon:
This icon indicates the status of the Pressure regulation.
If the icon is grey the Pressure regulation is OFF.
If the icon is green the Pressure regulation is ON (active).

Zero key:
This key is used to zero the output from the force transducer. Pressing this key will reset the baseline of the chart traces without affecting the calibrations.

3.3 Pressure menu

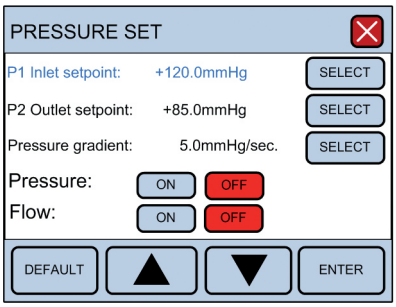
The Pressure is controlled from this menu. Use the “SELECT” key to select the line to be changed. When selected the line change color is blue (edit mode). Use the “DEFAULT” button or the arrow keys to change the setpoint value. Pressing “ENTER” will save the new setpoint.



P1 Inlet setpoint is the pressure value that the regulator is setting on the inlet side of the Myograph. Pressure range is 0-250mmHg.

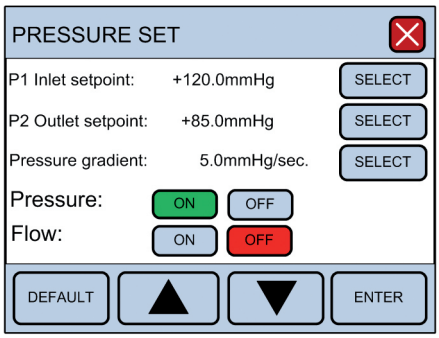
P2 Outlet setpoint is the pressure value that the regulator is setting on the outlet side of the Myograph. Pressure range is 0-250mmHg.

Pressure gradient This sets the speed at which the regulator modifies the pressure. The pressure change range is 1-10mmHg/sec.



NOTE
P1 MUST NEVER BE LOWER THAN P2 TO PREVENT BACKFLOW IN THE SYSTEM.

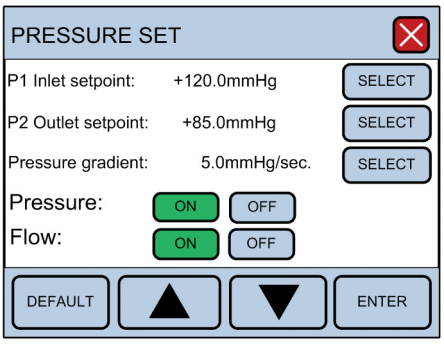
The Pressure regulator and the Flow are also controlled from this menu.
To turn the Pressure regulator ON press the Pressure ON button. When activated the button changes to Green.



In the Main Menu the pressure icon also turns to green when pressure regulation is on.

ON

To turn the Flow ON press the Flow ON button. When activated the key changes to Green.

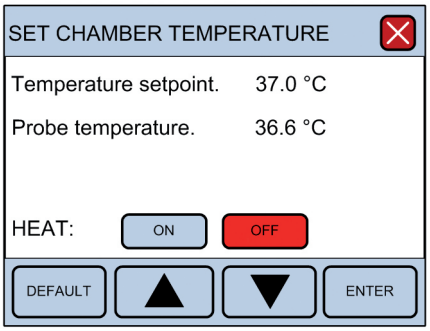


In the Main Menu the Flow icon also turns to green when Flow is on.

ON

3.4 Heat Menu

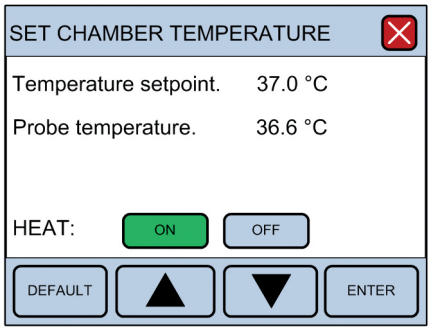
The Chamber and Bottle heating temperature are controlled from this menu. To turn the heat on, or to change the temperature for the system, press the “HEAT” button in the Main Menu. The display will enter the Heat menu and allow the user to change the system temperature, as well as turn heat on or off. Pressing “DEFAULT” will automatically reset the temperature setpoint to 37 °C. Manually change the temperature by pressing the up or down arrows. Pressing “ENTER” will save the new temperature setpoint.



To turn the heat on, touch “ON” and the “ON” button will turn green. The system will heat to the designated temperature setpoint.

In the Main Menu the thermometer icon turns to green when the heat is on.

ON

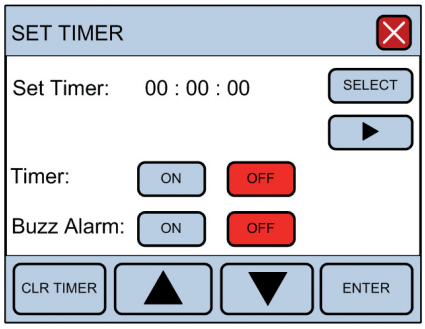


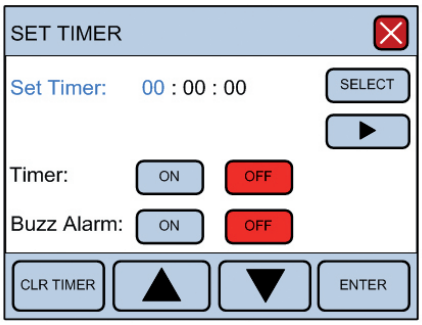
3.5 Timer Alarm Menu

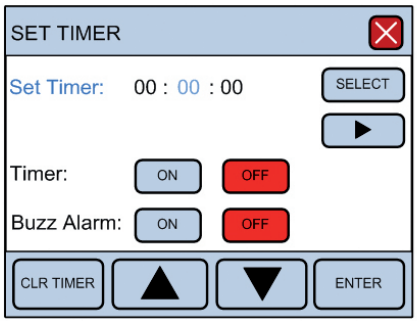
The Timer and Buzzer Alarm are controlled from this menu.

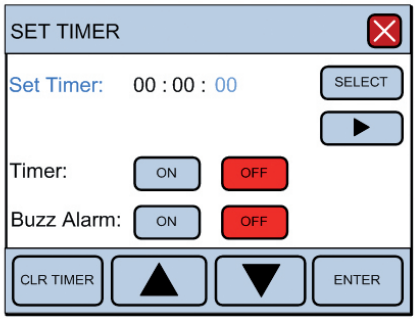
Use ”SELECT” to program the timer. The timer can be programmed in intervals from 0 to 23:59:59 (Hours : minutes : seconds). When Set Timer is selected use the up and down arrows to program the timer. The hours are programmed first, and then use the “RIGHT” button to get to the minutes and then the seconds.

Pressing “ENTER” will save the programmed time.



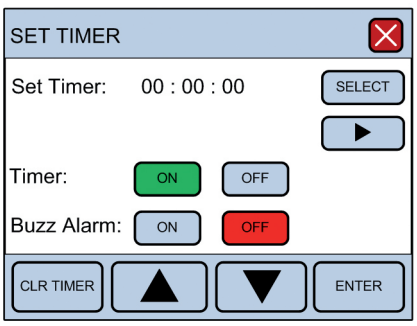






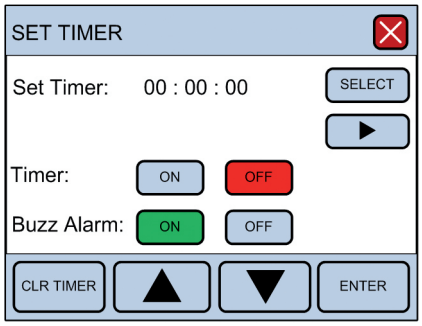
To start the “Timer” press the Timer “ON” button. When the Timer is on, the button turns green. When the timer reached zero it switches automatically to “OFF”.

If the Buzzer is set ON it will make a tone when the timer reaches zero.



To activate the “Buzzer Alarm” press the Buzzer Alarm “ON” button. When ON the button turns green and in the Main Menu the bell icon also turns green.

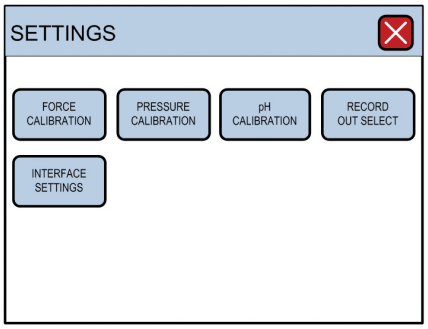
ON



3.6 Settings Menu

The “**Settings Menu**” contains several sub-menus. These sub-menus include:

FORCE CALIBRATION
PRESSURE CALIBRATION
pH CALIBRATION (optional)
RECORD OUT SELECT
INTERFACE SETTINGS



3.6.1 Force calibration Procedure

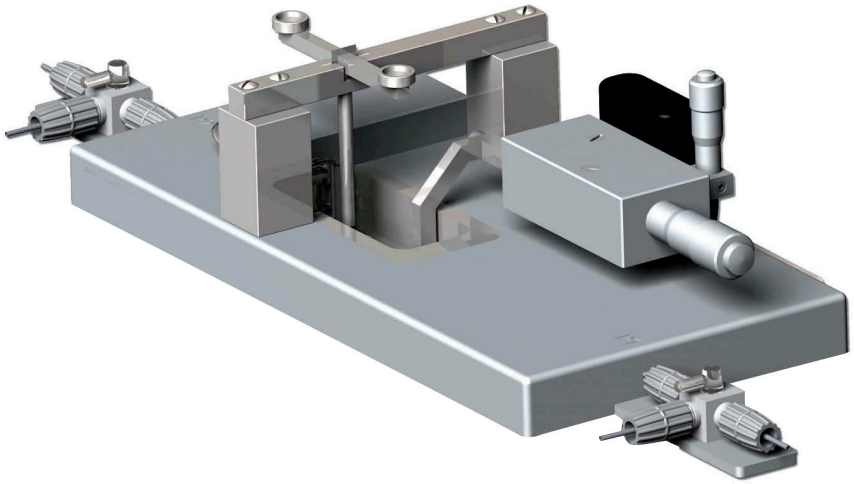


Figure 3.1 *- Weight Calibration Set up*

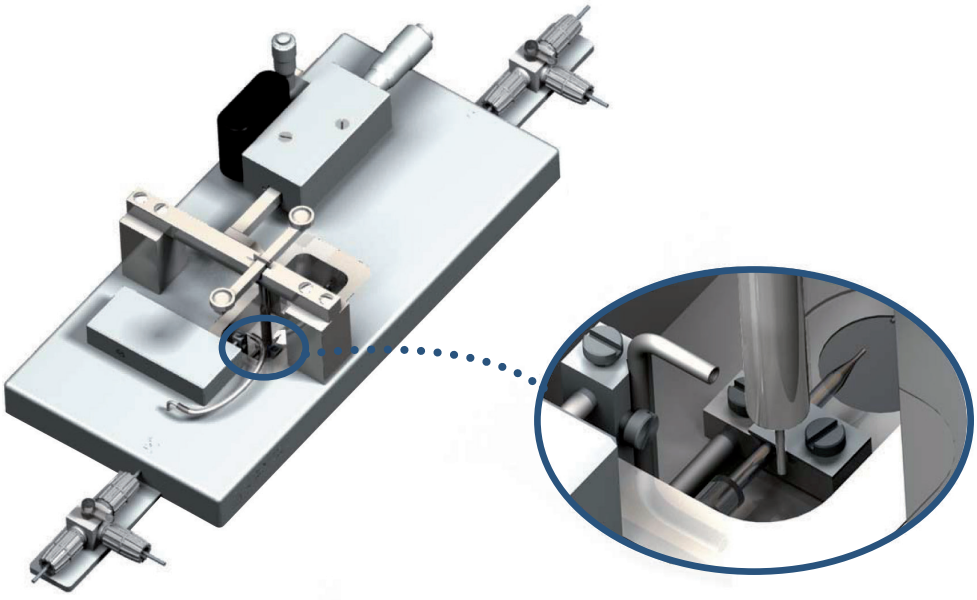
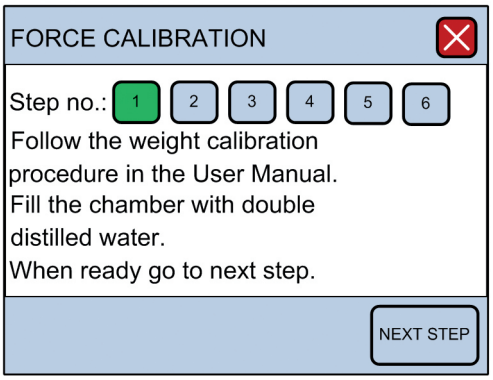


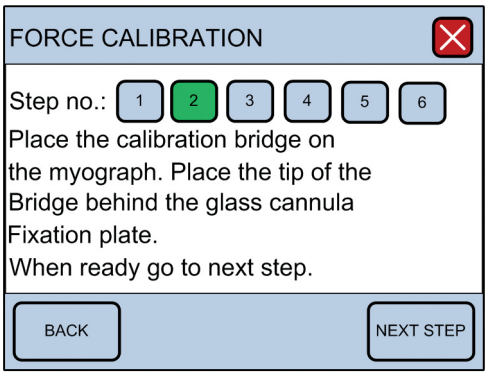
Figure 3.2 *- Illustration of how to fit the balance just behind the glass cannula fixation plate*

Enter the **FORCE CALIBRATION** sub-menu to begin the transducer calibration. The display will show the force calibration procedure.


FORCE CALIBRATION
Step no.: 1 2 3 4 5 6
Follow the weight calibration
procedure in the User Manual.
Fill the chamber with double
distilled water.
When ready go to next step.
NEXT STEP

Step 1 - The calibration procedure is listed in 6 individual steps and needs to be performed one at a time to calibrate the system. Step 1 involves setting up the chamber for calibration. Fill the chamber to a normal level with double-distilled water. Press “NEXT STEP”.

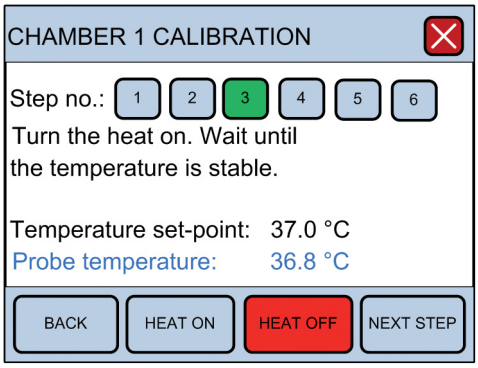
Step 2 - Involves setting up the calibration kit for the actual weight calibration.


FORCE CALIBRATION
Step no.: 1 2 3 4 5 6
Place the calibration bridge on
the myograph. Place the tip of the
Bridge behind the glass cannula
Fixation plate.
When ready go to next step.
BACK
NEXT STEP

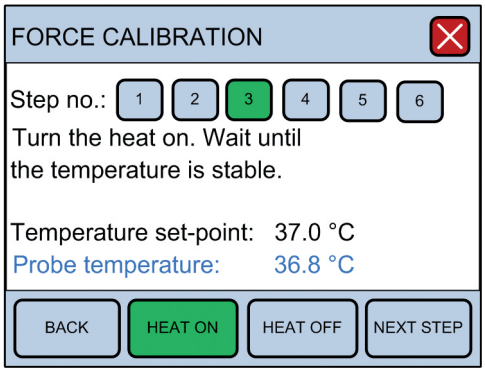
Make sure that the tip of the calibration bridge arm is placed behind the glass cannula fixation plate as illustrated in fig. 3.71. Carefully move the calibration bridge until the tip of the arm is placed freely behind the glass cannula fixation plate. It should not be touching the fixation plate.

Press “NEXT STEP” when the calibration kit has been properly placed.

Step 3 - This step initiates the heating process for the chambers. In order for the calibration to be accurate, the transducers must be heated to the same temperature to be used in your experiment. This allows for heat-induced expansion of the electronic parts in the transducer. Otherwise, inaccurate readings and transducer drift may occur.

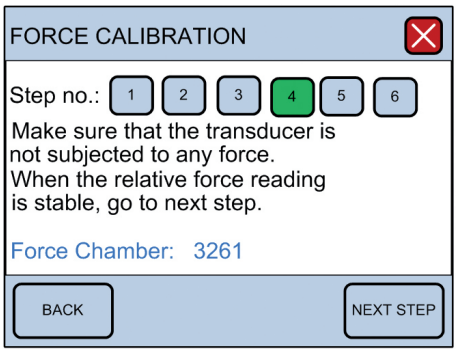


To start heating, press “HEAT ON”.



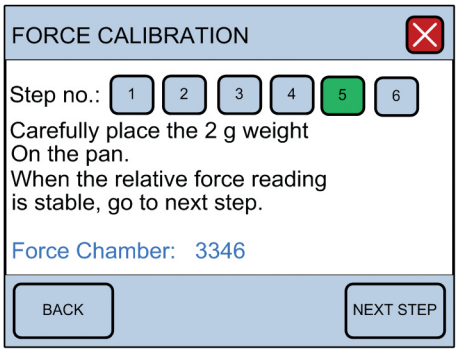
Covering the chambers with the chamber covers will expedite the heating. Place the temperature probe into the chamber for the first calibration to monitor when the chamber has reached the target temperature. With the covers heating will take about 20 to 30 minutes for the chambers and transducers to reach 37 °C. Once the chamber(s) are heated and have reached the target temperature, press “NEXT STEP”.

Step 4 - This is the first step in the actual weight calibration process. A 4-digit number will be displayed in blue at the bottom of the screen. If nothing has been disturbed during the heating process, the zero / 0 gram calibration should be stable. The 4-digit number will not fluctuate and after 30-45 seconds “NEXT STEP” can be pressed. If the 4-digit number is not stable, wait before pressing “NEXT STEP”.

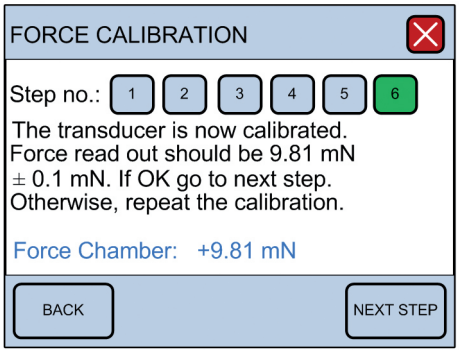

FORCE CALIBRATION
Step no.: 1 2 3 4 5 6
Make sure that the transducer is
not subjected to any force.
When the relative force reading
is stable, go to next step.
Force Chamber: 3261
BACK
NEXT STEP

Step 5 - This step is the 2 gram weight calibration. At this step, place the 2 gram weight in the pan closest to the transducer (over the transducer) to simulate the stretch created by the contraction of a mounted muscle preparation.

Remember, a 2 gram weight in a 90° vector is divided, and the transducer will only detect 1 gram or 9.81 mN of force. The weight placement should cause a positive increase in the 4-digit number. Wait at least 30 to 45 seconds for the applied force to stabilize before pressing “NEXT STEP”. Only when the 4-digit number has stabilized should you press “NEXT STEP”.


FORCE CALIBRATION
Step no.: 1 2 3 4 5 6
Carefully place the 2 g weight
On the pan.
When the relative force reading
is stable, go to next step.
Force Chamber: 3346
BACK
NEXT STEP

Step 6 - This step verifies that the calibration was performed correctly. The “Force Chamber” reading should be 9.81 ± 0.1 mN. If the “Force Chamber” reading is off by more than 0.1 mN, then remove the weight, press “BACK” to return to Step 4, and repeat the calibration process. If the “Force Chamber” reading is satisfactory, then press “NEXT STEP” to end the calibration.
After calibrating the force transducer, carefully remove weight, balance and calibration bridge. The Pressure Myograph System is now ready for longitudinal force measurements.


FORCE CALIBRATION
Step no.: 1 2 3 4 5 6
The transducer is now calibrated.
Force read out should be 9.81 mN
± 0.1 mN. If OK go to next step.
Otherwise, repeat the calibration.
Force Chamber: +9.81 mN
BACK
NEXT STEP

3.6.2 Pressure Calibration Procedure

The setup to perform the pressure transducer calibration procedure is illustrated in Fig. 3.3. Carefully follow the procedure described below to calibrate the Pressure Interface System. The calibration procedure is listed in 5 individual steps and needs to be performed one at a time to calibrate the system.

Figure 3.3 *Illustration of setup for pressure transducer calibration*

Step 1 - involves setting up the Myograph Chamber for pressure calibration.

Step 2 - Connect the “Big Ben” Pressure Manometer to the 3-way valve at P1 on the Pressure Myograph Chamber as illustrated in fig. 3.3.

Step 3 - Inside the Myograph Chamber, on the right hand side, is a small stainless steel pipe, which is connected to the right glass cannula via a small silicone tube (Fig. 3.4 B). Carefully disconnect the silicone tube from the stainless steel pipe.

Step 4 - Carefully disconnect the silicone tube between the “outlet connecting pipe” and the “outlet pressure transducer connecting pipe”, fig. 3.4 A.

Step 5 - Close the inlet from the Pressure Interface to P1 by turning the handle on the 3-way valve towards the normal inlet way. The inlet to P1 now comes from the pressure manometer. See fig. 3.3.

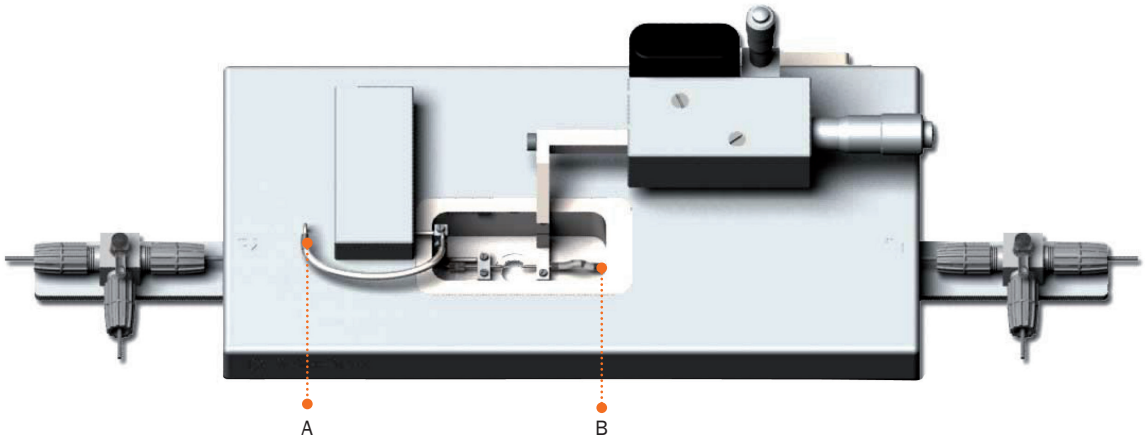


Figure 3.4 *Disconnection of silicone tubes*

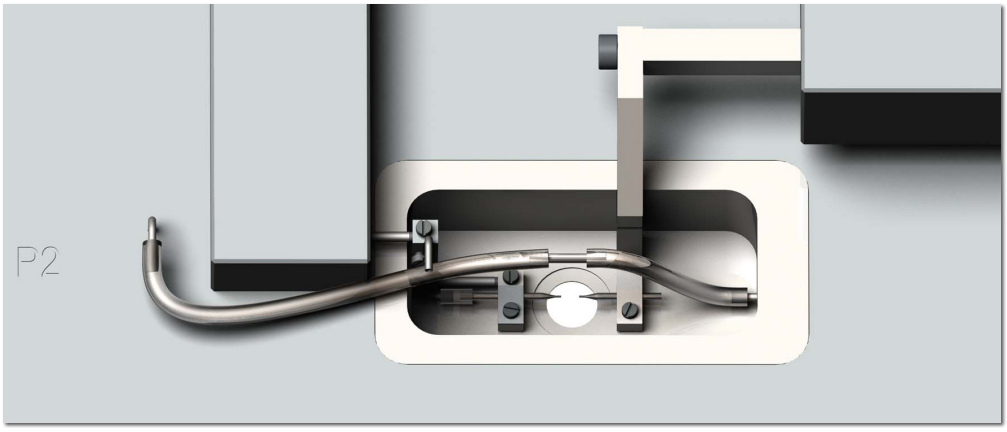
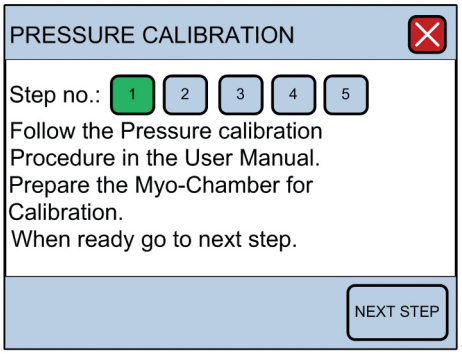


Figure 3.5 *Mounting of "Resistance tube shunt"*

3.6.2.1 Pressure calibration

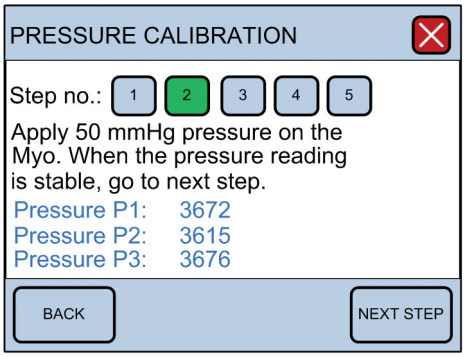
Press “setting” in the “Main Menu” and then press “Pressure Calibration”

Step 1 - Press “NEXT STEP” when the system is ready.



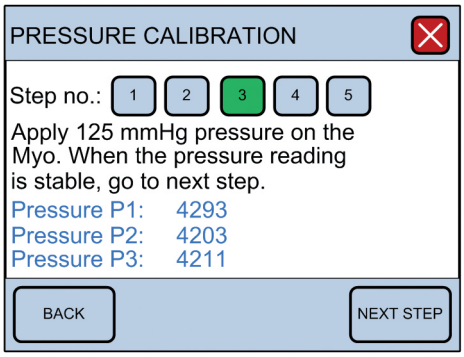
Step 2 - Apply a pressure of 50mm Hg on the Pressure Myograph using the “Big Ben” Pressure Manometer. When the 3 blue lines of relative values stabilize, go to “NEXT STEP”.

The relative values should between 3300 to 3900.



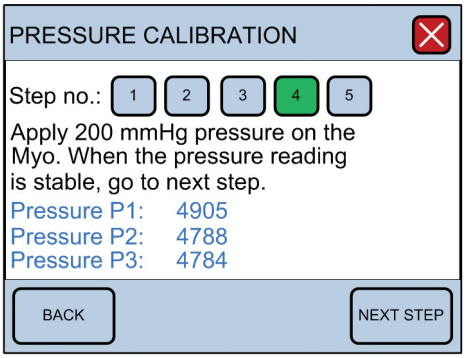
Step 3 - Apply a pressure of 125mm Hg to the Pressure Myograph Chamber using the “Big Ben” Pressure Manometer. When the 3 blue lines of relative values stabilize, go to “NEXT STEP”.

The relative values should between 3900 to 4500.



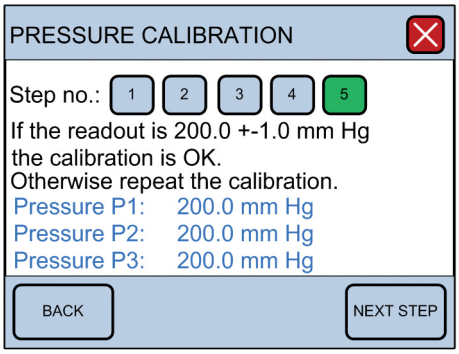
Step 4 - Apply a pressure of 200mm Hg to the Pressure Myograph Chamber using the “Big Ben” Pressure Manometer. When the 3 blue lines of relative values stabilize, go to “NEXT STEP”.

The relative values should between 4600 to 5200.



Step 5 - The calibration is now finished. The readings in the three bottom lines are the actual pressure on all three pressure sensors. The values must be 200.0 +/-1.0mm Hg.

Carefully remove the “Calibration Shunt Tube” and reconnect the tubing to the glass cannulas.

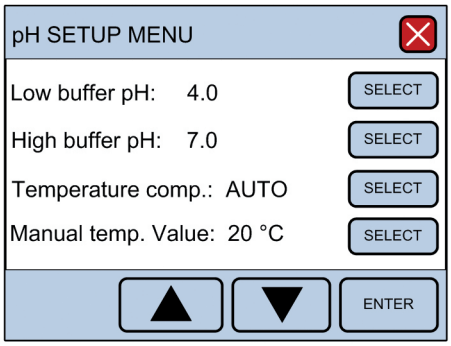

PRESSURE CALIBRATION
Step no.: 1 2 3 4 5
If the readout is 200.0 +-1.0 mm Hg
the calibration is OK.
Otherwise repeat the calibration.
Pressure P1: 200.0 mm Hg
Pressure P2: 200.0 mm Hg
Pressure P3: 200.0 mm Hg
BACK
NEXT STEP

3.6.3 pH Calibration Procedure (optional)

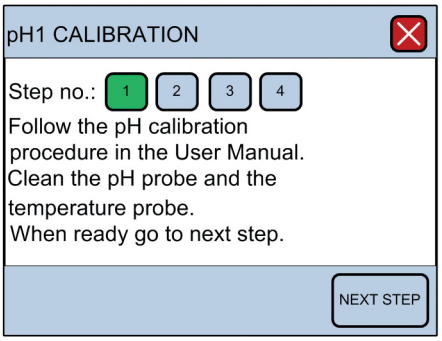
Before the pH calibration is performed be sure to select the way the pH sensor is to be used. See the sub-menu “pH SETUP” under INTERFACE SETTINGS.

The temperature is an important parameter in the calibration formula and is obtained automatically if AUTO is selected in Temperature compensation function, shown below.

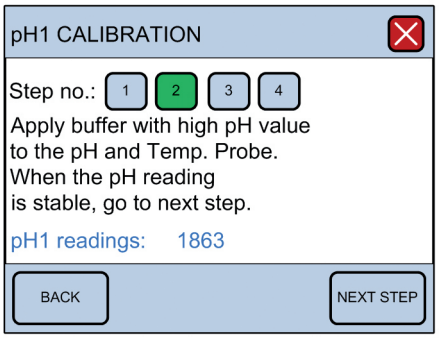
If MANUAL is selected, the Manual temperature is used in the pH calibration formula, and the temperature probe is de-activated.
In the MANUAL mode, the temperature of the calibration buffers is measured with a thermometer and entered manually in the “manual temperature” line.



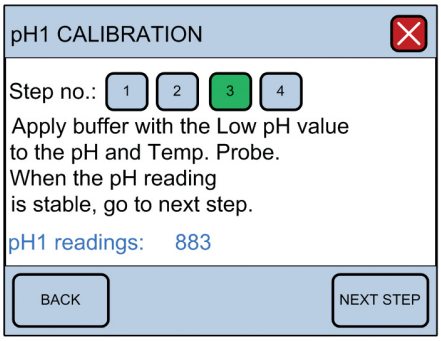
Step 1 - The pH calibration procedure is listed in 4 individual steps and needs to be performed one at a time. Step 1 involves cleaning the pH probe and the temperature sensor with double distilled water. When ready Press “NEXT STEP”.


pH1 CALIBRATION
Step no.: 1 2 3 4
Follow the pH calibration
procedure in the User Manual.
Clean the pH probe and the
temperature probe.
When ready go to next step.
NEXT STEP

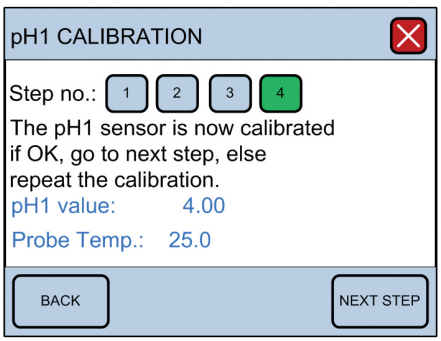
Step 2 - Place the pH-meter electrode and temperature probe in the HIGH buffer solution (here pH 7) and turn on stirring of the HIGH buffer solution. When the relative pH output in the blue line is stable, go to “NEXT STEP”.


pH1 CALIBRATION
Step no.: 1 2 3 4
Apply buffer with high pH value
to the pH and Temp. Probe.
When the pH reading
is stable, go to next step.
pH1 readings: 1863
BACK
NEXT STEP

Step 3 - Place the pH-meter electrode and temperature probe in the LOW buffer solution (here pH 4) and turn on stirring of the LOW buffer solution. When the relative pH output in the blue line is stable, go to “NEXT STEP”.

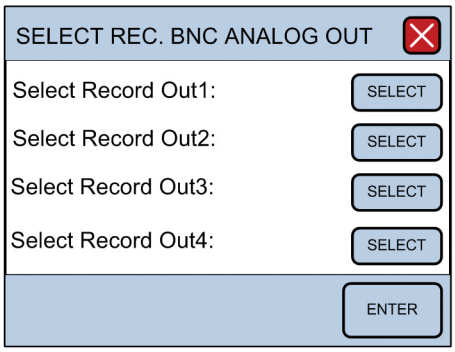

pH1 CALIBRATION
Step no.: 1 2 3 4
Apply buffer with the Low pH value
to the pH and Temp. Probe.
When the pH reading
is stable, go to next step.
pH1 readings: 883
BACK
NEXT STEP

Step 4 - The calibration is now finished. The values in the two bottom lines are the actual pH reading, and the temperature reading.

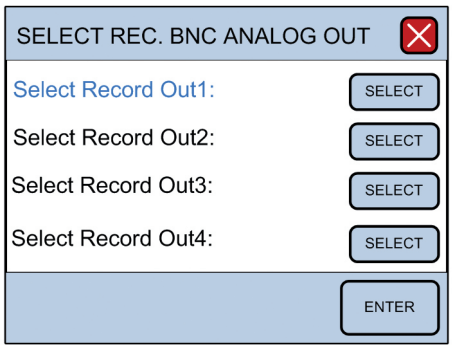


3.6.4 Analog Record Out Select (optional)

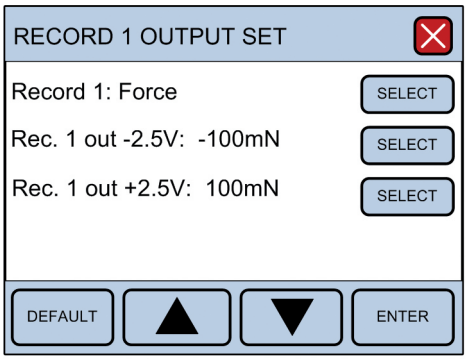
The RECORD OUT SELECT sub-menu determines how data is sent to the BNC analog outputs at the back of the Pressure Interface. There are 4 analog outputs. Each output is individually programmable. Any change made to RECORD OUT will only affect the data collected by the external data acquisition system (such as an AD Instruments PowerLab). So it is important to check the data acquisition setup when a change is made to the analog output with this setting. The analog output works in range of -2,5V to +2,5V.



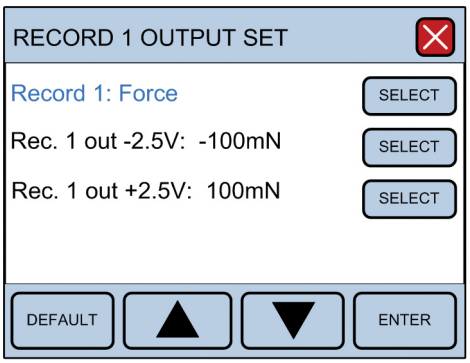
Use “SELECT” to select the OUT channel number to be changed. Press “ENTER” to go to the output setup.



Use “SELECT” to select the line to be changed.



Use the arrow keys or “DEFAULT” to change/select a new setup.



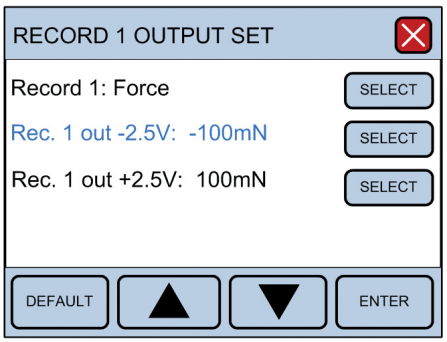
The following parameter in the Pressure Interface can be selected as output on the Analog channel. Force, Probe temperature, Chamber temperature, pH1, Pressure regulation ON/OFF, Flow ON/OFF, (Optional: Digital output 1, Digital output 2, Digital input 1, Digital input 2), Pressure P1, Pressure P2.

When the parameter is selected press “ENTER” to save the value.

The output range is -2,5V to +2,5V. The user can select the parameter value that gives

-2,5V and the value that gives +2,5V. In this example -100mN is -2,5V and +100mN is +2,5V.

Selecting asymmetrical values is also valid. They can be -2,5V = 0mN and +2,5V = 100mN.

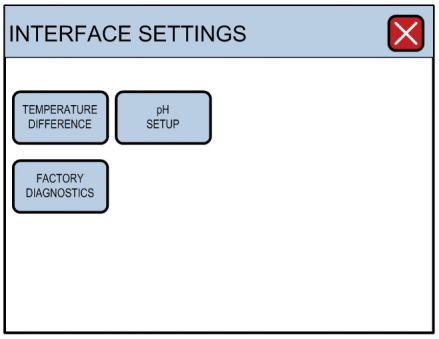


NOTE
REMEMBER TO PRESS THE “ENTER” KEY TO SAVE THE LINE CHANGES TO MEMORY.

3.6.5 Interface settings

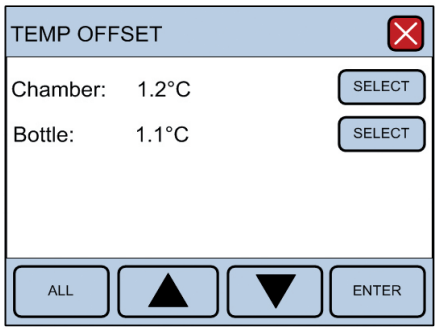
The INTERFACE SETTINGS sub-menu in SETTINGS has an additional 3 sub-menus. These 3 additional sub-menus are:

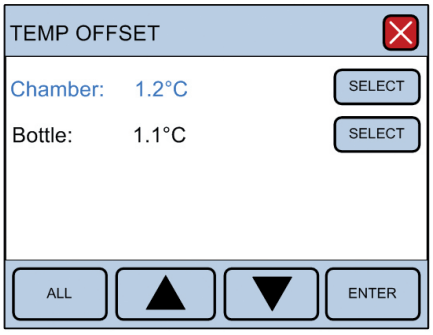
TEMPERATURE DIFFERENCE
pH SETUP
FACTORY DIAGNOSTICS



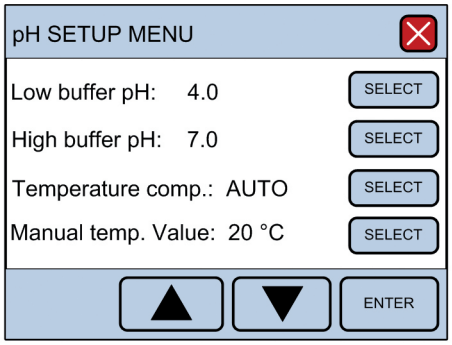
3.6.5.1 TEMPERATURE DIFFERENCE (OFFSET)

The TEMPERATURE DIFFERENCE function allows the user to fine-tune the temperature setpoint of the system. Although the temperature setpoint for the system can be set in the HEAT MENU, the actual temperature for the system may not heat to the exact setpoint. This function allows the user to adjust the temperature of the chamber and bottle individually so the EXACT temperatures can be reached. This is referred to as a temperature offset (TEMP OFFSET on chamber). The “SELECT” and “ALL” functions are the same in this menu as previously described. Pressing “ENTER” will save the values for future experiments.





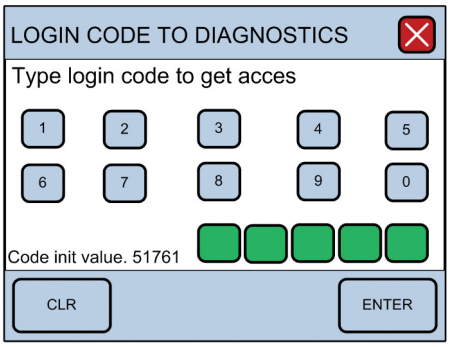
3.6.5.2 pH SETUP MENU



Before the pH calibration is performed, be sure to have selected the way the pH sensor is intended to be used. This is done in the sub menu “pH SETUP”.

The temperature is an important parameter in the calibration formula and is obtained automatically if AUTO is selected in the Temperature compensation, as shown below.
If MANUAL is chosen, the Manual temperature is used in the pH calibration formula, and the probe temperature is deactivated.
In the MANUAL mode, the temperature of the calibration buffers is measured with a thermometer and entered manually in the “manual temperature” line.

3.6.5.3 FACTORY DIAGNOSTICS



Entering FACTORY DIAGNOSTICS will display the LOGIN CODE TO DIAGNOSTICS window. This window is for trained technicians and is used for diagnostics and troubleshooting purposes. The general user will not have access to this window. Entering the proper 5-digit pin number, however, will give the trained technician access to Diagnostics panels that will provide information during a malfunction, or mechanisms to change other settings controlled by the onboard computer.

APPENDIX 1 - SYSTEM SPECIFICATIONS

TECHNICAL SPECIFICATIONS

External 100-240VAC to 24VDC adapter:	±10%
Current max.:	3.3Amps at 24VDC.
Dimensions LxDxH in cm:	34 x 25 x 15
Net weight:	5kg.
Environmental humidity:	20% to 80% RH, non-condensing.
Environmental operating temperature:	+15 to +40°C.
Environmental storage temperature:	+4 to +70°C.
Fluid capacity:	500 ml bottles. We recommend a volume of 400ml to ensure optimal pressure regulation.
One pH input range:	pH 0-14
pH calibration:	manual with instructions on the display.
4 analog outputs:	BNC connectors at rear to connect to external data recorder.
Analog output range:	±2.5Volt.
Output impedance:	<200 Ohm.
Air connection:	maximum pressure 1 Bar.
USB connector:	For downloading firmware and connection to PC.

TRANSDUCER DATA

Maximum range:	±200mN.
Operating temperature:	+15 to +50°C.
Frequency range:	0 – 20Hz.

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